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Dual and Multiple Exchange Rate Systems in Developing Countries

Some Empirical Evidence

Nita Ghei
and
Miguel A. Kiguel

The parallel exchange rate (whether official or unofficial) and the resulting spread over the official exchange rate are primarily determined by macroeconomic policies. Policymakers should be cautious in adopting dual (or multiple) exchange rate systems, as they provide less insulation for domestic prices than most analysts assume.

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This paper — a product of the Macroeconomic Adjustment and Growth Division, Country Economics Department — is part of the department's project, Macroeconomic Implications of Multiple Exchange Markets in Developing Countries. Copies of the paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Raquel Luz, room N11-059, extension 34303 (April 1992, 31 pages).

Ghei and Kiguel empirically examine the determinants of the parallel exchange rate for a cross-country sample of developing countries. The sample includes countries in which the parallel exchange rate is official (dual exchange rate systems) as well as those in which it is unofficial (black market).

In the typical exchange rate arrangements considered, the central bank fixes or pegs one rate (the commercial rate), used primarily for current account transactions, and allows the parallel exchange rate, used for capital account transactions, to be market-determined.

They base their empirical analysis on a portfolio macroeconomic model in which the parallel exchange rate is determined by expectations and equilibrium asset considerations in the short run — but depends on the evolution of key policy variables (such as the stock of money, budget deficits, and trade policy) in the long run.

The results indicate that macroeconomic variables explain more than 70 percent (on average) of the variation in the spread between the official and parallel exchange rates. The results are stronger for countries where the spread is large (above 35 percent), somewhat weaker in countries with moderate spreads (between 10 and 35 percent), and poor when the spread is below 10 percent.

They cannot reject the hypothesis that there are no differences in the determinants of the spread when the parallel rate is official and unofficial. This is not entirely surprising, as in most cases where the parallel rate is unofficial, it is largely tolerated by the authorities.

In addition, although they cannot reject the hypothesis that restrictions on the capital account affect the spread, they find that restrictions on the current account have no affect on it. These results are consistent with their prior finding that portfolio considerations dominate the determination of the parallel rate in the short run.

They find evidence that the adoption of dual exchange rate systems at best only partly insulates domestic prices. This insulation may be limited by three factors:

- There may be a leakage of transactions from the official to the parallel market.
- Depreciation of the parallel exchange rate can enter inflationary expectations.
- The spread might be an important factor when the central bank determines the rate of devaluation of the official exchange rate. Ghei and Kiguel find empirical evidence supporting this factor.

Dual and Multiple Exchange Rate Systems in Developing Countries: Some Empirical Evidence*

by
Nita Ghei**
and
Miguel A. Kiguel***

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* This paper is part of the CECMG project on "Macroeconomic Implications of Multiple Exchange Markets in Developing Countries."

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I. Introduction

Most developing countries impose restrictions on foreign exchange transactions, especially on the capital account. The imposition of this type of restrictions generally leads to the emergence of a parallel foreign exchange market. Dual exchange rate systems are one way of introducing these restrictions. In that system there are two officially accepted exchange rates: a commercial exchange rate for current account transactions, and financial exchange rate for capital account transactions. In the typical arrangement the commercial exchange rate is either pegged or managed, while the financial exchange rate is market determined. In other cases, an illegal (or black) parallel market develops in response to the imposition of restrictions to operate in the official foreign exchange market for certain trade and capital transactions.

Official dual exchange rates are typically adopted in response to a particular macroeconomic shock (this was the case for both Mexico and Venezuela at the outbreak of the debt crisis). Illegal foreign exchange markets, on the other hand, emerge as a response to market imbalances caused by legal restrictions on trade and capital flows. These markets vary in size, depending on how extensive restrictions are and the extent to which the official exchange rate is inconsistent with overall macroeconomic conditions.

The principal motivation for resorting to a dual exchange rate system is to protect international reserves in a balance of payments crisis without resorting to maxi-devaluations, which can be inflationary. By adopting this system, the central bank can fix the official exchange rate and yet avoid any loss in reserves from speculation against the domestic currency which is instead channelled to the parallel foreign exchange market. At the same time, domestic prices are partly insulated (at least in theory), as the authorities can defend the fixed exchange rate which is used for trade, while they maintain greater control of the money supply.

The main purpose of this paper is to examine empirically the determinants of the spread between the two exchange rates. In addition, it will examine the ability of the system to insulate domestic prices from movements in the parallel exchange rate. The paper will look at a large sample of developing countries.[1] In selecting the sample of countries we made two important decisions: first, we study together countries with official and unofficial parallel foreign exchange markets, because our premise was that the behavior of the parallel rate is similar in both cases; second, we divided the sample in countries with high premiums on the one hand, and low and moderate premiums on the other, because the relationship between the parallel rate and the fundamental factors affecting it are expected to be clearer in the former group.

In this paper we take the view that, especially in the short run, the parallel exchange rate (and hence the spread between both exchange rates) is primarily determined by the evolution of macroeconomic variables, expectations and portfolio considerations. We will argue that this view is useful for countries in which the parallel exchange rate is official and for those in which is illegal.

The paper will be organized as follows. Section II sets out a basic portfolio model for a dual exchange rate system, which is based in Kiguel and Lizondo(1990) and belongs to the same strand of thought as Dornbusch et al. (1983) and Lizondo (1987) among others. Section III presents the econometric results for the determinants of the parallel premium for a panel of twenty high and moderate premium (developing) countries, as well as individual estimations for twenty-one countries. Section IV investigates the insulation properties of the dual exchange rate system of domestic prices. In section V we present the main

[1] In dual exchange rate systems the parallel market is official. In most cases, however, the parallel foreign exchange market is illegal (black), though usually tolerated.

conclusions of this paper study and relate them to other works.[2]

II. A Model for a Dual Exchange Rate System

There has been considerable interest in the functioning of dual exchange rate markets and the effect of their presence on various macroeconomic variables. Two excellent surveys on the existing literature have recently been written by Lizondo (1990) and Agenor (1990a). Analytical models for parallel markets can be classified into the following four categories (Agenor,1990a): smuggling and real trade models, the monetary approach, portfolio and currency substitution models and, most recent, models of dual markets with leakages.

In this section we present a portfolio model based on Flood (1978), Lizondo (1987) and Kiguel and Lizondo (1990), which serves as the basis for the econometric estimations presented in the next section. The model assumes a small open economy with one traded good and one non-traded good. All commercial transactions take place at the official rate E_0, which crawls at a rate π. All financial transactions take place at the parallel rate E_p, which is determined by the market. Private sector nominal wealth, W, is :

$$W=M+E_pF \tag{1}$$

where M is nominal money stock and F is the stock of foreign assets held by private agents. Private sector consumption of traded and non-traded goods respectively is

$$c_T=\alpha a(m+qF) \tag{2}$$

---

[2] In particular we will compare them to the studies for Argentina [Kamin(1991)], Mexico [Kaminsky(1991)], Sudan [Elbadawi(1991)] and Tanzania [Kaufman and O'Connell(1990)]. as well as the comparison of the European MER arrangements with some of the Latin American MERs [Marion(1991)] prepared for the project on the "Macroeconomic Implications of Multiple Exchange Rate Systems," at the World Bank.

where α is the proportion of private sector expenditure devoted to traded goods, $m = M/E_0$ and q is E_p/E_0, the parallel premium.

$$c_N=(1-\alpha)\,a\,(m+qF)\,e \tag{3}$$

where $e= E_0/P$ is the real exchange rate.

Government consumption of traded and non-traded goods is given by g_T and g_N respectively. Total government expenditure is

$$g=g_T+g_N \tag{4}$$

Equilibrium in the non-traded goods market requires

$$[(1-\alpha)\,a\,(m+qF)+g_N]\,e=y_N \tag{5}$$

where y_N is the value of output in the sector.
Change in international reserves is equal to the current account balance

$$\dot{R}=y_T-\alpha a\,(m+qF)-g_T \tag{6}$$

where y_T is the value of traded goods.
It is assumed that domestic credit creation is used to finance the public sector deficit and therefore change in domestic credit,D, is

$$\dot{D}=E_0(g-t) \tag{7}$$

where t is revenue of the government. Combining equations 6 and 7, the change in real money stock is given by

$$\dot{m}=y_T-\alpha a\,(m+qF)+g_N-t-\pi m \tag{8}$$

The composition of the private sector portfolio depends on the expected rate of depreciation of the parallel rate. Assuming perfect foresight,

$$\dot{m}=\lambda\left(\frac{\dot{E}_B}{E_B}\right)qF=\lambda\left[\left(\frac{\dot{q}}{q}\right)+\pi\right]qF, \tag{9}$$

which describes the evolution of the parallel premium. Setting

$$\dot{m}=\dot{q}=0,$$

we obtain the following steady state conditions,

$$\alpha a(m+qF)=y_T+g_N-t-\pi m \tag{10}$$

and

$$\lambda^{-1}\left(\frac{m}{qF}\right)=\pi \tag{11}$$

and the steady state values of the money stock and parallel premium are

$$m^*=\frac{\lambda(\pi)\,[y_T+g_N-t]}{\alpha a[\lambda(\pi)+1]+\pi\lambda(\pi)} \tag{12}$$

and

$$q^*=\frac{1}{F}\frac{[y_T+g_N-t]}{\alpha a[\lambda(\pi)+1]+\pi\lambda(\pi)} \tag{13}$$

These stationary equilibrium solutions, in particular the one for the parallel premium is the basis for the estimation of the co-integration and error correction equations for the parallel premium in Section 3. These solutions suggest the following general relationship:

$$q=f(F,\pi,D)$$

where

$$f_1<0, f_2=?, f_3>0$$

A larger stock of foreign assets will reduce the parallel exchange rate. Higher deficits will result in an increase in the level of the parallel premium. In addition, in the short run, the premium will be affected by expectations of a devaluation on the official exchange rate, or the an approaching balance of payments crisis.

III. The Empirical Estimation

The model presented in the preceding section indicates that the size of the parallel premium depends on the consistency between monetary policy and exchange rate policy, expectations of devaluation of the official exchange rate, the size of the budget deficit, and the nature and scope of controls in the current and capital accounts of the balance of payments.

For estimation purposes we focused primarily on certain macro variables. In particular, we examine the relationship between the parallel premium, the money stock, the stock of international reserves, and expectations of devaluation of the official exchange rate. From the preceding discussion, the following hypotheses were formed. There should be a positive relationship between the parallel exchange rate and the money stock, as postulated by simple monetarist models (e.g. Blejer (1978). The relevant definition of money for this purpose is mainly an empirical question, and we find that M2 is useful in most cases. Large changes in the money supply which are not accommodated by proportional changes in the official exchange rate signal inconsistent macro policies, thus leading to an increase in the premium. Second, falling stocks of international reserves in countries with limited access to external financing could signal the approach of a balance of payments crisis which would cause the parallel rate to depreciate and the premium to increase. Third, expectations of devaluation of the official exchange rate in the immediate future should lead to a depreciation

of the parallel rate and an increase in the premium. In some cases, devaluations can be predicted by looking at the evolution of the real official exchange rate; a strong real appreciation could indicate that a devaluation is in the making. The deviation of the real exchange rate from its equilibrium value would then influence the level of the parallel premium.

a. Evidence From Individual Countries

In this section we will run similar regressions explaining the premium for each of the countries in our sample. Given that the macroeconomic variables that we use are likely to evolve along similar paths, we first test for cointegration. The parallel premium could be said to be cointegrated with these variables in the sense of Engle and Granger (1987). For the following expression, where q_t is the parallel premium and F is the vector of fundamentals,

$$\ln q_t = \beta' F \tag{14}$$

if both q_t and F are first difference stationary, then equation (14) is integrated of order zero, and hence the left hand side describes a co-integration relationship, where ß is the cointegrating vector. The equilibrium error is integrated of order zero and hence we can talk about a stable equilibrium relationship between the premium and the fundamentals. The residual from the cointegrating equation is the estimated 'error'. The error-correction equation, then, provides a specification for the short run dynamics of the behavior of the parallel premium and has the following representation:

$$\Delta q_{t+1} = -B(RESD)_t + u_t \tag{15}$$

where RESD is the residual from the cointegration equation and u_t is a

disturbance term. From the statistics obtained from the Dickey-Fuller tests[3], all the series seem to be first difference stationary for the sample of twenty-one countries (see appendix table 2 for the list of countries in the sample). Therefore, the procedure followed for estimating the cointegrating relationship would seem to be reasonable.

The following specification was estimated for the countries included in our sample. The fundamentals chosen were the broad money, stock of non-gold international reserves, deviation of the real exchange rate form the equilibrium and lagged level of the premium.

$$\ln q_t=\beta_0+\beta_1 \ln m_t+\beta_2 \ln R_t+\beta_3 \Delta \theta_t+\beta_4 \ln q_{t-1}+e_t \tag{16}$$

where m_t is broad money divided by the official exchange rate, R_t is the stock of non gold international reserves denominated in US dollars, Δe_t is deviation of the real exchange rate form its equilibrium value and ϵ_t is an iid error term. The expected signs of the coefficients are:

$$\beta_1>0, \beta_2<0, \beta_3>0, \beta_4=?$$

The procedure used for estimating disequilibrium of the real exchange rate was the following. The real exchange rate, e_t was defined as:

$$e_t=\frac{E_t \cdot p^*_t}{p_t} \tag{17}$$

where E_t is the nominal official exchange rate, p^*_t is world price and is proxied by the US producer price index and p_t is domestic price, using the domestic consumer price index. The equilibrium real exchange rate depends on a number of fundamentals, such as fiscal and monetary policy, the terms of trade, availability and size of foreign financing and aid, etc. Unfortunately, these

[3]Results of the Dickey-Fuller tests are available on request.

variables are not available for majority of the countries in our sample with the frequency used for the estimation. Instead, the equilibrium real exchange rate was calculated as a twelve period (quarter) moving average. This assumes that the actual real exchange rate observed during a span of three years roughly corresponds to the equilibrium one. The difference between the calculated and the actual real exchange rate was used to proxy for the extent of disequilibrium of the real exchange rate at any point in time.

$$\Delta \ln \hat{e}_t = \ln \hat{e}_t - \ln e_t \qquad (18)$$

We used a sample of twenty-one developing countries for which quarterly data are available. In turn, we divided the sample between countries having high premia (i.e. in excess of 35 percent) on average, and moderate premia (i.e. below 35 percent on average. There were thirteen countries in the high premium group, and seven experienced premia averaging between 10 and 35 percent. The rationale for this division is that we expect the relationship between the premium and macroeconomic variables would be clearer in high premium countries than in the countries with moderate premia. In addition, high premium countries were also subject to larger macroeconomic imbalances. For most countries estimation was for the sample period was 1970 to 1990 using quarterly data. All data are from the IFS tapes except the parallel exchange rate which are obtained from various issues of the World Currency Yearbook, Pick's Currency Yearbook and Currency Alert. Periods when the exchange rate was unified were excluded.[4] Dummies were used for Bolivia, DUMMY1 for the period of the hyperinflation, DUMMY2 for the period following. In some cases, lagged values of the variables were used with or instead of the current values. Lagged money was used in the case of Tanzania,

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[4] For Argentina, this means excluding the period from the last quarter of 1976 to the end of 1980. The period from the last quarter of 1977 to the second quarter of 1981 was excluded from the regression for Chile (1970-1990). For Colombia, this meant excluding the period from the third quarter of 1977 to the second quarter of 1981 and for Ecuador it extended from the third quarter of 1973 to the end of 1974. In the case of Venezuela, estimation was only for the period 1983 to 1989. For Mexico, the period was 1976 to 1987. Dual exchange arrangements were in place in these countries for only the stated periods.

Zambia, Kenya and Pakistan in the cointegration equation. The lagged value real exchange rate variable was used for Ethiopia, Argentina, Bolivia and Brazil. We found lagged change in money to be appropriate for the error-correction equation for Pakistan. For most cases we included a lagged dependent variable for the cointegration equation (with Ghana, Tanzania, Zambia, Argentina, Bolivia, the Dominican Republic and Peru being the exceptions). This lagged variable was also included in some of the cases for the error-correction equation (including Ethiopia, Venezuela, Turkey and Colombia, among others). The precise specification of the estimated equations differs slightly for each country, but the fundamentals are the same. The results of the estimations for the cointegration and error-correction equations are reported in tables 1 and 2 respectively.

Table 1. DETERMINANTS OF THE LEVEL OF THE PARALLEL PREMIUM
Dependent variable $LPRE_{t+1}$

OCountry	Constant	$LM20_t$	$LM20_{t-1}$	$LRESVD_t$	$LRESVD_{t-1}$	RER_t	RER_{t-1}	$LPRE_{t-1}$	$\overline{R}^2$	DW	DF	ADF(4)
High Premium Countries:												
Egypt	-0.93 (-2.43)	0.14 (1.67)		-0.08 (-0.86)		2.12 (4.01)		0.76 (12.84)	0.86	1.48	-6.27	2.00
Ethiopia	-3.02 (-2.58)	0.31 (2.38)		0.15 (1.45)			-0.51 (-1.19)	0.80 (9.26)	0.79	1.88	-8.31	[illegible]
Ghana	-13.29 (-7.74)	1.40 (7.92)		0.72 (3.21)		0.10 (6.92)			0.77	1.53	-6.42	-3.16
Nigeria	-1.89 (-2.33)	0.32 (3.40)		-0.16 (-2.66)		0.56 (3.56)		0.58 (7.21)	0.81	2.14	-8.92	-3.11
Tanzania	0.47 (0.43)		0.14 (1.14)	-0.27 (-3.40)		0.43 (2.18)			0.39	0.66	-3.60	-2.86
Zambia	1.35 (0.97)		-0.20 (-1.20)	0.003 (0.03)		0.24 (2.52)		0.91 (13.07)	0.77	1.96	-8.07	-3.46
Argentina	-6.08 (-1.98)	1.26 (3.24)		-0.90 (-4.97)			0.19 (0.27)		0.31	1.92	-6.91	-3.02
Bolivia[1]	-1.55 (-1.34)	1.04 (5.17)		-1.44 (-5.87)			2.55 (2.00)		0.69	1.28	-4.89	-2.68
Brazil	-2.67 (-0.72)	0.29 (0.41)			-0.004 (-0.01)		290.11 (0.94)	0.54 (4.70)	0.29	1.90	-6.97	-1.90
Chile	-6.89 (-2.45)	2.21 (3.09)		-1.83 (-3.36)		0.003 (0.24)		0.37 (2.28)	0.72	1.49	-3.53	-1.27
Dominican Republic	-6.49 (-5.13)	1.45 (5.73)		-0.98 (-5.84)		0.71 (2.69)			0.49	0.70	-3.47	-1.96
Peru	-14.60 (-3.09)	2.45 (3.38)		-0.94 (-2.78)		0.11 (0.54)			0.48	0.73	-2.91	-1.81
Venezuela	-11.23 (-3.39)	1.39 (2.72)		-0.28 (-0.88)		0.08 (1.44)		0.32 (3.31)	0.73	0.76	-1.89	-1.54
Moderate Premium Countries:												
Colombia	-4.31 (-1.85)	1.01 (2.12)		0.74 (-2.51)		0.03 (1.21)		0.57 (5.16)	0.61	2.32	-9.06	-2.68
Ecuador	-3.46 (-3.31)	0.74 (3.12)		-0.38 (-2.42)		0.02 (2.11)		0.79 (13.23)	0.91	1.64	-6.15	-4.68
India	-1.71 (-0.77)	0.07 (0.19)		-0.06 (-0.18)		-0.04 (-0.15)		0.17 (1.44)	-0.02	2.06	-8.65	-3.77
Kenya	1.03 (0.98)		0.05 (0.41)	-0.37 (-1.84)		0.10 (1.14)		0.60 (5.77)	0.54	1.86	-7.46	-2.60
Mexico	-7.39 (-1.64)	0.52 (1.48)		0.19 (1.02)		-0.001 (-0.32)		0.83 (9.46)	0.72	2.55	-8.99	-3.12
Pakistan	1.64 (1.16)		-0.30 (-1.53)		0.04 (0.20)	0.18 (2.70)		0.55 (5.89)	0.47	1.99	-8.07	-3.44
Turkey	-9.45 (-0.60)	3.99 (2.51)		-4.34 (-2.61)		-0.003 (-0.12)			0.12	2.33	-3.62	-1.52
Uruguay	-0.07 (-0.08)	0.16 (0.74)		-0.37 (-2.19)		0.03 (2.72)		0.55 (5.98)	0.70	1.98	-5.20	-1.99

Table 2. ERROR CORRECTION FOR THE PARALLEL PREMIUM
Dependent variable $DPRE_{t+1}$

Country	Residual	$DM2O_{t+1}$	$DM2O_t$	$DRESVD_{t+1}$	$DRER_{t+1}$	$DPRE_t$	$\bar{R}^2$	DW
High Premium Countries:								
Egypt	0.30 (1.54)	0.97 (2.02)		-0.07 (-0.78)	3.27 (5.09)	0.24 (1.50)	0.59	2.02
Ethiopia	1.18 (3.21)		-0.84 (-0.75)	0.05 (0.29)	-1.32 (-2.50)	0.89 (2.62)	0.19	1.92
Ghana	0.64 (6.54)	-0.46 (-1.27)		0.09 (0.24)	0.15 (16.33)		0.86	1.85
Nigeria	0.87 (4.46)	0.75 (1.81)		-0.09 (-0.57)	0.48 (2.14)	0.31 (1.95)	0.43	1.96
Tanzania	0.34 (3.81)	0.26 (0.56)		0.06 (0.64)	0.03 (1.45)		0.30	2.09
Zambia	1.21 (2.93)	0.71 (1.43)		-0.07 (-0.59)	0.12 (0.87)	1.10 (2.84)	0.13	1.97
Argentina	0.96 (6.80)	1.11 (2.37)		-0.96 (-2.55)	6.51 (0.91)		0.49	1.99
Bolivia	0.42 (3.31)	1.38 (2.19)		-0.32 (-1.14)	-0.42 (-0.28)		0.33	2.34
Brazil	0.39 (2.76)	2.42 (2.55)		-1.10 (-1.67)			0.19	2.04
Chile	0.50 (2.38)	1.16 (0.69)		-2.78 (-5.03)	0.05 (2.51)		0.59	2.02
Dominican Republic	0.25 (3.27)			-0.17 (-1.67)	1.09 (5.96)		0.36	2.09
Peru	0.24 (2.53)	1.77 (2.73)		-0.60 (-1.02)			0.16	1.83
Venezuela	0.32 (1.41)	1.93 (2.56)		-0.48 (-0.84)	0.03 (0.40)	0.27 (2.68)	0.77	1.90
Moderate Premium Countries:								
Columbia	0.56 (4.18)	0.20 (0.10)		-0.74 (-1.00)	0.07 (1.84)		0.26	2.32
Ecuador	0.96 (4.04)				0.03 (4.68)	1.02 (4.85)	0.33	1.89
India	0.83 (6.78)	3.65 (1.24)		-1.64 (-1.50)	-0.21 (-0.62)		0.43	1.98
Kenya	0.89 (3.19)	-1.63 (-1.54)		-0.35 (-1.13)	0.17 (1.80)	0.53 (2.15)	0.17	2.08
Mexico	0.50 (3.36)	0.54 (0.66)		-0.80 (-2.02)	-0.001 (-0.29)		0.23	1.92
Pakistan	0.32 (4.39)		2.11 (2.93)		0.26 (4.06)		0.34	1.74
Turkey	0.09 (1.21)	2.24 (2.83)		-0.62 (-1.28)	0.006 (1.43)	-0.58 (-4.26)	0.44	2.28
Uruguay	0.78 (3.29)	0.005 (0.004)		-0.80 (-2.29)	0.02 (1.15)	-0.30 (-1.65)	0.34	2.34

Notes for Tables 1 and 2:

Source: IFS, World Currency Yearbook, and Currency Analysis (various issues)
Data are quarterly end of period.
Figures in parentheses are t-statistics
Variables:
LPRE: ln(premium)
LM2O: ln(Money/Official Exchange Rate)
LRESVD: ln(non-gold international reserves)
RER: Deviation of real exchange rates from equilibrium
DPRE: change in ln(premium)
DM2O: change in ln(Money/Official Exchange Rate)
DRESVD: change in ln(non-gold international reserves)
DRER: change in RER

Statistics:

DF: Dickey-Fuller
ADF: Augmented Dickey-Fuller
DW: Durbin-Watson

1: The cointegration equation for Bolivia included the following dummies:
DUMMY1: 3.41(10.30) for the period of the hyperinflation.
DUMMY2: -1.97(-3.87) for the periof following the hyperinflation.

As may be expected, the results are clearer and stronger for the high premium countries. Money stock has the expected sign for all high premium countries and is significant for most. The coefficients obtained for the level of international reserves are negative for nine of the thirteen of the high premium countries and is statistically significant at the 5 percent level for most. The level of international reserves is not statistically significant for the cases where the coefficient has a positive value, with Ghana being the sole exception. The coefficient obtained for the term representing deviations from equilibrium of the real exchange rates has the expected sign for all the high premium countries andis statistically significant for the majority. The R^2 and the Durbin-Watson statistic are quite good, though the presence of the lagged dependent variable term does bias the Durbin-Watson towards a value of 2. The Dickey-Fuller as well as the Augmented Dickey-Fuller tests strongly support the hypothesis of cointegration, with the exception of Venezuela. However, the period under consideration for Venezuela is extremely short (six years) and the weakness of the Dickey-Fuller test statistic is to be expected.

The results are not quite so strong for the moderate premium countries. Excluding Pakistan, the coefficient for the money stock has the expected sign for all the moderate premium countries in the sample. The money stock is positive though not significant for India, Kenya, Mexico and Uruguay; it is negative but not statistically significant for Pakistan. The coefficient for international reserves has the expected sign for six of the moderate premium countries, Pakistan and Mexico being the exceptions. However, the coefficient for international reserves is not significant for either country; neither is it statistically significant for India or Kenya, even though it has the expected sign. The results for the real exchange rate term are more mixed, but the coefficient has the expected sign for every case it is statistically significant. Cointegration is supported for most of the countries, but the result of the augmented Dickey-Fuller test is ambiguous for Kenya, Turkey and Uruguay.

The error-correction equation is a flexible specification of the short run dynamics. The residual from the cointegration equation measures the 'error',

that is, the extent of disequilibrium in the market. Regressing the change in the parallel premium on last period's residual yields an estimate of the correction in the 'error'. In this case, the residual term captures the short-run impact of the portfolio factors that were used as the fundamentals in the cointegration equation. In most cases we expanded the error-correction specification to include the first difference of the fundamentals, the money stock, level of international reserves and the real exchange rate variable as well as a lagged value of the dependent variable.

The results of the error correction equations are, in general, quite good, even for the moderate premium countries. They indicate that the short run behavior of the premium is primarily influenced by portfolio considerations and changes in variables such as the money stock and the level of international reserves are important. The residual 'error-correction' term is positive for all countries and statistically significant, with the exception of Egypt and Venezuela in the sample of high premium countries and Turkey in the sample of moderate premium countries . While the weakness of the results for the case of Venezuela are to be expected, given the brevity of the period with dual exchange rates, the results for Egypt and Turkey are puzzling. It is possible that the results would improve with the inclusion of other, country specific variables. In most cases the coefficient of the error-correction term is less than 1, providing support for the hypothesis of stable dynamics. The exceptions are Ethiopia and Zambia, both countries subject to extensive controls. Zambia was subject to various terms of trade shocks through the period under consideration and underwent several regime changes. Elbadawi and Aron(1991) include a terms of trade variable as well as regime change dummies in their estimation and do not find any evidence of unstable dynamics. Since this paper is concerned more with providing results across a broad spectrum of countries, rather than detailed results for an individual country, we prefer not to expand our specification for country-specific features.

In several cases the evolution in the money stock is relevant and statistically significant in the determination of the short run behavior of the parallel premium. This includes high permium countries, such as Egypt, Argentina,

Bolivia, Brazil, Peru and Venezuela, as well as moderate premium countries, such as Pakistan and Turkey. The change in international reserves is statistically significant in the cases of Argentina, Chile, Mexico and Uruguay. The change in the disequilibrium of the real exchange rate has a postive and significant coefficient for Egypt, Ghana, Nigeria, Chile, Dominican Republic, Ecuador and Pakistan. The results obtained tend to support the view that the parallel premium exhibits very similar behavior across the sample, regardless of country-specific features in the dual exchange rate arrangements. Further, portfolio factors dominate the behavior of the parallel premium in the short run in both high and moderate premium countries.

Our results are broadly in agreement with those obtained in more detailed individual country studies on the determinants of the parallel exchange rate. Most of these studies include a variable measuring the deviation from parity of the domestic interest rate from the world interest rate. Theory suggests that interest rate differentials are an important factor in determining exchange rates and should be relevant in determining the parallel premium. However, the countries in our sample differ substantially in availability of data on domestic interest rates and the reliability of such data. Many of them have repressed financial systems and it would be extremely difficult to obtain any reasonable estimate of interest rates that would be consistent across the sample and over the time period under consideration. In some of the country studies, the specification is expanded to include variables such as terms of trade and tax rates on exports and imports as well as dummies for regime shifts. These refinements improve the results obtained in these studies. However, the essential results obtained do not contradict the results obtained here.

Kamin(1991) finds evidence of cointegration between the parallel premium and the macroeconomic fundamentals for Argentina (the fundamentals used are the commercial exchange rate, domestic prices, real GDP, dollar export price, dollar import price as well as tariff rates). Money and the domestic interest rate are included in the estimation for the short run portfolio relationships. Portfolio factors are important in the determination of the parallel premium in the short run in Argentina according to Kamin, which is the result we obtain. He also

finds no evidence to support insulation due to the dual exchange rate system in the case of Argentina, which is in line with what we find (see Section 4, tables 4 and 5). Kaufman and O'Connell estimate a single equation incorporating both long run trade variables as well as short run portfolio factors for Tanzania. They find that the empirical evidence supports the relevance of both trade and portfolio factors in determining the behavior of the parallel premium. Portfolio factors, in particular, seem to important in the short run. Hausmann adapts the basic Kiguel-Lizondo framework to incorporate the instability inherent in Venezuela during the period from 1983 to 1988 when a multiple exchange rate system was adopted. Ansu includes in the cocoa smuggling that is important for the parallel market in Ghana. Phylaktis(1992) uses a variant of the Dornbusch model and a cointegration-error correction approach to examine the parallel market in Chile, allowing specifically for foreign exchange restrictions on international trade and capital transactions. The results obtained in most of these studies tend to support the relevance of portfolio factors in determining the short run behavior of the parallel premium. Trade factors, such as tariffs and quotas as well as macroeconomic variables, including the real exchange rate and the money stock help determine the long run behavior of the premium.

Our work can also shed some light on the puzzling results presented in Marion(1991). She finds that for Belgium, France and Italy, the premium does not respond to changes in domestic fiscal policy, while it is negatively correlated to the money stock. According to her paper, the premium is best explained by the dollar/domestic currency interest rate differential. Her explanation is that the parallel exchange rate in the European economies responds to different factors than in Latin America.

In our view, the main reason for the dissimilar results is the size of the premium. The European countries in fact had very low premia (it rarely exceeded 10 percent), certainly much smaller than most countries in Latin America, or Africa (with premiums exceeding 100 percent). As we discussed in the previous section, the relationship between the premium and the fundamentals is much weaker (in the sense that it is more difficult to capture it econometrically) in the former group. Thus, the inability to explain the premium in the European

countries is probably more related to econometric difficulties than to the inappropriateness of the analytical framework.

b. Additional Cross Country Evidence

We also estimated a single equation for the level of the parallel premium using annual data from a panel of twenty high premium countries. The objective of this exercise was to evaluate the robustness of the results obtained for the individual countries, and to investigate whether there are any behavioral difference in countries (or periods) where parallel markets are official and those where they are not. In addition, we looked in a crude way at the relative importance of restrictions in the capital and current account on the pre[illegible].

We use a random effects procedure as set out in Hausman and Taylor(1981) to account for unobservable, country-specific effects. Since this requires a balanced panel, a dummy was introduced for the period when exchange rates were unified in the countries in the sample. The fundamentals used were the real money stock and the fiscal surplus to GDP ratio. We included four dummy variables to account for countries or periods in which: (i) the foreign exchange market was unified, (ii) the parallel market was official, (iii) there were restrictions in the current account, (iv) there were restrictions in the capital

Table 3: Panel Estimation for the Level of the Parallel Premium

Dependent Variable: $LPRE_t$

Regressor	Version 1	Version 2	Version 3
Constant	0.62 (5.87)	0.66 (6.07)	-0.50 (-1.78)
$LRMO_{t-1}$	0.24 (2.61)	0.22 (2.47)	0.22 (2.61)
$FSUR_t$	-0.36 (-2.28)	-0.35 (-2.19)	-0.47 (-3.07)
DUMMYU	-3.24 (-7.77)	-3.17 (-7.72)	-3.19 (-6.86)
DUMMYO	--	-0.50 (-1.53)	0.17 (0.48)
RESCUR	--	--	-0.06 (-0.15)
RESCAP	—	--	1.26 (2.89)
R^2	0.26	0.27	0.37
DW	1.40	1.43	1.52

Notes:

LRMO: $M2/E(1+\delta GNP)(1+\delta P^*)$, FSUR: Fiscal Surplus/GNP
DUMMYU: Dummy for periods of unified exchange rates, DUMMYO: Dummy for official dual exchange rate system.
RESCUR: Restrictions on payments on the current account, RESCAP: Restrictions on payments on the capital account.
Annual data 1976-1988. List of countries in the panel is in Appendix Table 1.
Source: IFS, World Currency Yearbook, Exchange Arrangements and Exchange Restrictions (various issues), RAL-2.

account.

The coefficients all have the expected sign. Higher money stock has a positive effect on the level of the parallel premium. A smaller budget surplus (or a higher budget deficit) will result in a higher parallel premium. A unifiedexchange rate is expected to drive the parallel premium down (to zero) and hence the coefficient for DUMMYU is negative. When the dual exchange rate system is official, the element of risk involved in trading on the parallel market no longer exists and the premium should be smaller. We find that the coefficient for DUMMYO is negative but statistically insignificant. We also estimated the same equation with dummies for restrictions on payments on the current account and the capital account [RESCUR and RESCAP respectively[5]]. The dummy for restrictions on payments on the capital account is statistically significant, while the dummy for restrictions on payments on the current account is not. The coefficient obtained for RESCAP is somewhat large, but this could be due to the nature of the (0,1) dummy being used. The sign of the coefficient for DUMMYO changes but is still statistically insignificant.

We can conclude from these results that it makes little difference to the level of the parallel premium whether the dual exchange rate system is official or not. The evolution of monetary aggregates and the fiscal surplus are found to be important in determining the parallel exchange rate. This corroborates the findings of the previous section. In addition, the results broadly support the view that restrictions on the capital account have a significant effect in increasing the premium while restrictions on the current account do not appear to matter. While this is consistent with more casual empirical evidence (i.e. in countries with no capital controls there is no premium), the results should be taken with some caution because the variable that we constructed does not measure the intensity of controls.

IV. Insulation Properties on the Official Exchange Rate and Domestic Prices

[5] The dummies were constructed using information from "Exchange Arrangements and Exchange Restrictions (IMF, various issues)

One of the reasons that lead countries to adopt dual and multiple exchange rate systems is to insulate domestic prices from short term changes in the parallel exchange rate. This is achieved by fixing the official exchange rate and keeping it as a nominal anchor for prices. The ability to insulate domestic prices depends on the following two considerations: first, that the authorities in effect set the official exchange rate independently of the level of the parallel exchange rate, and second, that there are no leakages of transactions between the official and the parallel market. The more actively the authorities intervene to close the spread between the two rates, the closer these two rates will move together and hence the smaller will be the insulation provided by the system. Likewise, to the extent that the parallel exchange rate becomes the marginal cost for imports, and/or the marginal revenue for exports (e.g. because of smuggling), domestic prices will be more closely affected by the parallel exchange rate and insulation will be smaller.

In this section we will examine empirically the insulation properties of dual and multiple exchanger rate systems in the two ways described above. We will first examine the extent to which the authorities take into account the level of the premium in setting the rate of depreciation of the official rate and we will then turn to look at the direct effect of the parallel rate on domestic prices.

a. <u>The Impact of the Spread in Setting the Rate of Devaluation</u>

One way to examine whether the authorities take into account the effect of the spread in setting the rate of devaluation of the official exchange rate is to estimate an equation of the following form,

$$\Delta E_{o_t}=\alpha_1\Delta E_{o_{t-1}}+\alpha_2\Delta E_{o_{t-2}}+\alpha_3 q_{t-1}+\alpha_4 q_{t-2} \qquad (18)$$

where E_o is the nominal official exchange rate and q is the parallel premium. The more the rate of devaluation in the current period depends on the size of the premium in the previous periods, the smaller the insulation the system provides. We estimated this equation for a sample of twelve developing countries. In many

cases the second lag was excluded.[6] The period of estimation was 1970 to 1990 for most countries[7].

The results of the estimation are presented in table 4. In every case the coefficient for the last quarter premium term was statistically significant. The value of the coefficient obtained varied across the sample. It exceeded 1 only in the case of Argentina, and hence it is possible that there was some overshooting in the devaluation in the official rate. In six cases the size of the coefficient obtained is very small, less than 0.10. For the remaining five cases the coefficient varied between 0.10 and 0.50. It would seem that the level of the parallel premium is a significant factor in determining the timing of the devaluation. The size of the devaluation, however, would depend on the premium as well as other factors.

These results indicate that the authorities did take into account the spread between the two exchange rates in setting the devaluation of the official rate. In this respect the system did not provide the insulation that it was supposed

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[6] Second quarter lagged devaluation of the official rate was included for Argentina, Bolivia, Brazil and Chile. The fourth quarter lag was included as well for Brazil. Second quarter lagged premium was included in the estimation for Egypt, Tanzania and Mexico. Since Mexico had a crawling peg for the period under consideration, a constant term was included in the estimation.

[7] The period for Argentina and Mexico was first quarter,1982 to fourth quarter,1989. Estimation for Venezuela was fourth quarter, 1982 to fourth quarter, 1989. The period of unified exchange rates was excluded for Chile (fourth quarter, 1977 to second quarter, 1981)

Table 4: Devaluation of the Official Exchange Rate

Dependent Variable: $DOER_t$

Country	$DOER_{t-1}$	$DOER_{t-2}$	$DOER_{t-4}$	$PREM_{t-1}$	$PREM_{t-2}$	R^2	DW
High Premium Countries							
Argentina	0.45	-0.26		1.06		0.51	1.66
	(3.04)	(-1.73)		(5.91)			
Bolivia	0.06	0.09		0.27		0.69	2.17
	(0.98)	(1.30)		(11.42)			
Brasil	0.49	-0.19	0.39	0.30		0.74	2.01
	(5.04)	(-1.97)	(4.45)	(5.92)			
Chile	0.21	0.17		0.02		0.26	2.34
	(2.08)	(1.67)		(5.53)			
Dominican Rep.	-0.03			0.12		0.17	1.98
	(-0.27)			(4.60)			
Egypt	0.19			0.11	-0.09	0.06	2.03
	(1.18)			(2.17)	(-1.70)		
Ghana	0.03			0.01		0.10	1.98
	(0.28)			(3.91)			
Nigeria	0.40			0.02		0.21	1.92
	(4.02)			(2.72)			
Peru	0.32			0.24		0.45	1.78
	(4.12)			(7.68)			
Tanzania	0.30			0.09	-0.07	0.34	1.96
	(2.47)			(6.04)	(-3.93)		
Venezuela	-0.05			0.08		0.08	2.02
	(-0.30)			(2.73)			
Zambia	0.003			0.02		0.03	2.03
	(0.03)			(3.41)			
Moderate Premium Countries:							
Colombia	0.90			0.04		0.75	1.96
	(20.90)			(2.23)			
Ecuador			0.22[1]	0.12		0.37	2.09
			(2.46)	(3.09)			
Mexico[2]	0.15			0.42	-0.33	0.28	1.48
	(0.91)			(3.64)	(-2.63)		
Turkey	0.14			0.46		0.28	1.71
	(1.40)			(7.74)			

Notes:

Source: IFS, World Currency Yearbook, Pick's Currency Yearbook. Kamin(1991) for Argentina.

Data are quarterly, end of period for 1970-1990, except for Argentina, Mexico and Venezuela (see text for details). The period for unified exchange rates is excluded for Chile.

Figures in parentheses are t-statistics

DOER: Devaluation in the official exchange rate.
PREMIUM: Parallel Rate/Official Rate - 1.

1: $DOER_{t-3}$
2: Equation for Mexico includes a constant term with value 0.10(2.57)

to provide. It probably allowed the authorities to postpone devaluation in some circumstances, and in this way do not accommodate fully changes in the parallel exchange rate. However, on the whole this insulation was at best partial.

b. Insulation on Domestic Prices

A second way to examine the ability of the dual exchange rate system to insulate domestic prices is to estimate directly the relationship between the parallel exchange rate and domestic prices. In an open economy in which all goods are tradeable domestic prices should roughly follow purchasing power parity (adjusted for tariffs and other restrictions to trade, transport costs, etc.). The relevant exchange rate for the purchasing power calculation is mainly an empirical question which to a large extent depends on the ability of agents to circumvent existing restrictions. Chhibber and Shafik (1990) argue that in the case of Ghana the parallel exchange rate played a key role in determining domestic prices.

The way we proceed in this section is to look directly at the relationship between changes in domestic prices and in the parallel rate. In particular, we estimate the following specification for the same sixteen countries as before:

$$\Delta P_t = \gamma_1 \Delta E_{B_t} + \gamma_2 \Delta E_{B_{t-1}} \qquad (19)$$

where P is domestic CPI and E_B is the nominal parallel exchange rate. The period of estimation is identical to that used for the previous estimation. Since there are problems of multicollinearity, an instrumental variables procedure was used in the estimation. Instruments used included lags of the depreciation in the parallel rate and lagged (in some cases, current) rate of change in money stock.

Results from the estimation are reported in Table 5. In every case, we find that the coefficient for depreciation in the parallel rate is statistically

Table 5: The Insulation Equation

Dependent Variable: $INFL_t$

Country	$DBER_t$	$DBER_{t-1}$	DW	Q
High Premium Countries:				
Argentina	0.71 (6.45)	0.31 (3.12)	2.00	2.50
Bolivia	0.74 (6.98)	0.37 (4.08)	2.34	15.49
Brazil	0.73 (7.04)	0.20 (2.13)	1.78	20.92
Chile	0.44 (2.93)	0.05 0.44)	2.11	6.21
Dominican Republic	0.81 (2.49)	0.15 (1.12)	1.40	31.63
Egypt	0.87 (2.56)	0.13 (1.26)	1.77	27.90
Ghana	0.47 (2.05)	0.17 (2.35)	1.57	36.67
Nigeria	0.64 (2.12)	0.16 (1.89)	1.98	14.40
Peru	0.98 (6.80)	0.18 (1.70)	1.81	62.14
Tanzania	0.59 (2.05)	0.11 (1.50)	1.98	25.99
Venezuela	0.83 (1.91)	-0.18 (-0.78)	1.56	9.42
Zambia	0.31 (3.31)	0.14 (2.88)	1.45	37.96
Moderate Premium Countries:				
Colombia	0.69 (4.66)	0.24 (2.73)	1.24	76.49
Ecuador	0.80 (4.71)		1.39	45.17
Mexico	0.67 (3.36)	0.21 (1.65)	1.37	8.65
Turkey	0.73 (5.60)	0.29 (4.20)	1.94	39.20

Notes:

Source: IFS, World Currency Yearbook, Pick's Currency Yearbook. Kamin(1991) for Argentina.

Data are quarterly, end of period for 1970-1990, except for Argentina, Mexico and Venezuela (see text for details). The period for unified exchange rates is excluded for Chile.

Figures in parentheses are t-statistics

INFL: $\Delta \ln CPI$
DBER: Depreciation in the parallel rate. $\Delta \ln BER$

All estimation using instrumental variables. Instruments are lagged DBER and lagged or current rate of change of M2 (M1 for Argentina).

significant. In most cases the size of the coefficient exceeds 0.70 or is close to it. Somewhat smaller coefficients are obtained for Chile(0.44), Ghana(0.47), Tanzania(0.59) and Zambia (0.31). In the last three countries one should expect that the estimated coefficient will underestimate the true coefficient due to the imposition of extensive price controls. The official CPI was used to estimate inflation in all cases. For these countries, this procedure would understate thelevel of actual inflation. From the results, it is possible to say that the dual exchange rate system arrangements provides very little insulation to domestic prices. The largest coefficient we obtain is for Peru at 0.98, which would indicate that the DER provides no insulation whatsoever.

Given that most coefficients we obtained are less than 1, this could be taken as an indication that the DER system provides some insulation in the short run. This interpretation, however, in some cases will be misleading for two reasons. First, flexible exchange rates typically adjust faster than prices, thus suggesting that even if the effect were large, this might take several quarters to be fully reflected in domestic prices. Second, because over time there are changes in the prices of tradeables to nontradeables, one would expect some changes in the exchange rate not to be accompanied by proportional changes in domestic prices. In summary, the empirical evidence indicates that the DER system provides partial insulation on domestic prices.

V. Summary and Conclusions

This paper examined and tested some macroeconomic implications of multiple exchange rates arrangements for a large sample of developing countries. We tested the influence of certain macroeconomic fundamentals (the money supply, the stock of international reserves and the real exchange rate) on the behavior of the parallel premium. We also tested the hypothesis that a DER arrangement provides insulation to domestic prices by enabling the authorities to postpone a maxi-devaluation which could be inflationary. The countries in the sample were classified either as high premium (if mean annual premium exceeded 35 percent) or moderate premium (if mean annual premium was between 10 and 35 percent). We expected the relationship between the parallel premium and the macroeconomic

fundamentals to be empirically stronger for high premium countries relative to moderate premium countries.

Overall, we find remarkably similar results for the factors that determine the behavior of the parallel premium across a wide cross-section of developing countries, with substantial differences in the nature and duration of DER arrangements as well as the size of the parallel market and the level of the parallel premium. For countries with very high premia, the macroeconomic fundamentals are extremely important in determining the parallel premium. However, we find evidence to support the importance of portfolio factors for the short run behavior of the premium even in moderate premium countries. From the panel estimation, it is clear that whether the DER is official or not is irrelevant to the determination of the parallel premium. Restrictions on the capital account are important in determining the level of the parallel premium, but restrictions on payments on the current account are not. This is consistent with the observation that a parallel market in foreign exchange has not emerged in the CFA zone countries, where restrictions on trade exist but there are no restrictions on capital account transactions.

Dual exchange rate systems, at best, provide partial insulation to domestic prices. The extent of insulation diminishes as the authorities use the level of the parallel premium to determine the timing of devaluation of the commercial (official) exchange rate. Effectiveness of the dual exchange rate system in terms of insulation of domestic prices decreases as leakages between the two markets become more extensive.

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Appendix Table 1: PARALLEL MARKET PREMIUM (PERIOD AVERAGE)

COUNTRY	1970-1989	1970-1979	1980-1989	TREND
Algeria	199.93	74.47	324.78	26.24
Egypt	96.77	77.36	116.19	67.51
Ethiopia	83.36	50.33	116.38	47.18
Ghana	437.05	179.68	697.40	142.14
Malawi	52.47	56.45	49.04	34.40
Nigeria	93.90	34.81	152.99	24.30
Sudan	99.54	85.13	113.96	66.23
Tanzania	150.65	102.22	199.08	73.02
Zaire	95.14	136.14	54.14	32.03
Zambia	92.66	116.47	78.85	57.45
Argentina	62.54	85.40	39.68	21.93
Bolivia	43.79	21.26	66.33	9.77
Brazil	37.91	17.89	57.93	19.73
Chile	104.41	191.13	17.69	12.94
Dominican Republic	41.43	28.50	54.36	24.69
Ecuador	25.36	7.26	43.46	13.05
Mexico	10.46	0.84	20.08	7.55
Peru	64.00	54.67	82.33	10.73
Venezuela	43.06	0.54	85.58	1.94

NOTES:

Source: IFS tapes, World Currency Yearbook, Pick's currency Yearbook, Currency Alert, various issues

Premium = (Parallel Exchange Rate/ Official Exchange Rate) - 1
Premium is expressed as a percentage.

TREND: average for 1970-1989, excluding episodes with above trend premium.

Appendix Table 2: SAMPLE FOR QUARTERLY ESTIMATION

Number	Country
1	Egypt
2	Ethiopia
3	Ghana
4	Nigeria
5	Tanzania
6	Zambia
7	Argentina
8	Bolivia
9	Brazil
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